**STUDY GUIDE**

**⁸College of Dentistry, Lahore Medical & Dental College**

**Science of Dental Materials Curriculum (2022)**



**Head of Department:**

Dr. Usman Mahmood *BDS, M.Sc. (UK)*

*Professor & Head of the Department*

**Faculty Members:**

Dr. Omair Anjum *BDS, PG Dip. (UK), FICD (USA), M.Sc. (UK) Associate Professor*

Dr. Fatima Suhaib *BDS, MPhil.*

*Senior Lecturer*

**Demonstrators**:

Dr. Asma Ali BDS

Demonstrator

Dr. Minal Mirza BDS

Demonstrator

**INTRODUCTION:**

The science of Dental Materials deals with the physical, mechanical, chemical & biological properties of all materials used in conventional & modern dentistry. An understating of properties and handling of materials is absolutely essential in both clinical and laboratory settings. It involves the study of composition, manipulative techniques, application of dental materials and their interaction with the oral environment.

The Department of Dental Materials aims to provide the students with the scientific background and the clinical skills required to handle modern dental materials. The department has a dedicated, state of the art laboratory which enables the students to practice the manipulative techniques before their application in the clinical setup.

**SCOPE & SEQUENCE:**

Science of Dental Materials is a subject taught to students of 2nd Year of BDS. Lectures/group discussions, tutorials and practicals are held thrice in a week during the academic calendar. In the Dental Materials department, students learn to manipulate and identify different Dental Materials taught through-out the year.

During the 2th year of BDS, 3 lectures and two tutorial classes will be delivered weekly. Students will complete 37 weeks of classes in the Science of Dental Materials department and will accomplish their academic requirements.

**CURRICULUM**

**Course Objectives**

* Define characteristics associated with the physical and chemical properties of matter, explain and compare matter to energy.
* Understand the properties of dental materials including; Mechanical, Thermal, electrical, corrosive, solubility, flow, adhesion, wetting, viscosity, retention, curing, and composition.
* Explain the uses of amalgam in dentistry. Perform proper mixing of Amalgam
* List the chemical components of amalgam alloy and explain the effects of each component on the final amalgam mix.
* List the chemical components in the powder and the liquid of zinc phosphate cement and explain the effects on a mix if the composition is altered.
* Explain the uses of zinc phosphate cement and compare the differences in technique in preparing each.
* Perform mixing of zinc phosphate cement according to its use and explain the effect of variations in technique on the properties: consistency, setting time, strength, solubility, and dimensional change.
* Describe use of a glass ionomer cement and list the components.
* Perform mixing of glass ionomer and explain the effect of variations in technique on the following properties: consistency of the mix, setting time of the mix, strength of set material, optical properties of mix and set material, and solubility of the set material.
* List the uses of zinc oxide-eugenol cements and compare the differences in technique in preparing each.
* List the uses of resin cements and bonding agents and the differences preparing each.
* List the chemical components in a resin cement.
* List the esthetic filling materials and explain and compare the differences and/or similarities of the technique used in their preparation.
* Perform mixing or preparation of any esthetic filling material according to its use and explain the effect of variation in technique on the following properties: consistency of mix, setting time of mix, compressive strength of set material, solubility of the set material.
* List the types of gypsum products and compare their uses and origins.
* Explain the effects of variations in the water: powder ratio, spatulation, chemical additives and insert fillers on the following properties of gypsum products: setting times, setting expansion, strength and hardness and produce an acceptable study cast.
* Identify the following impression materials: agar (reversible hydrocolloid), poly vinyl siloxane, alginate (irreversible hydrocolloid), polyether, and rubber base and be able to categorize them into: rigid impression materials, plastic impression materials, elastic impression materials, or rubber impression materials.
* Classify resin materials according to heat cured resins and self-curing resins.
* Name the main component of reversible hydrocolloid material and the derivation of this material.
* Describe the manipulation of reversible hydrocolloid material, explain the effects of variations in technique on the following properties: viscosity of the sol, gelation temperature, ability to reproduce detail, strength, set or resistance to deformation and dimensional stability.

|  |  |  |
| --- | --- | --- |
| **Serial No.** | **UNIT TITLE** | **LEARNING OBJECTIVES/CONTENTS** |
| 1 | **Welcome & Introduction to course outline** | *Students will be able to understand*  Goals of Dentistry, Classification of Dental Materials, Ideal Properties of Dental Materials. |
| 2 | **Welcome & Introduction to course outline** | Uses of materials in modern dentistry, overview of materials for dental applications. |
| 3 | **Structure of matter and principles of adhesion** | *Students will be able to understand*  Change of state, Interatomic Primary Bonds, Secondary Bonds, Interatomic bond distance & Bond Energy, Crystalline & Non-Crystalline Solids, Diffusion, Thermal Energy, Adhesion & Bonding, Surface Energy, Wetting, Contact Angle & Adhesion to tooth structure. |
| 4 | **Physical Properties of Dental Materials** | *Students will be able to understand*  Definition of Physical Properties, Abrasion & Abrasion resistance, Viscosity, Creep/Flow. |
| 5 | **Physical Properties of Dental Materials** | *Students will be able to understand*  Thermo physical Properties, Difference b/w Tarnish & Corrosion, Galvanism & its clinical significance. |
| 4 | **Mechanical Properties of Dental Materials** | *Students will be able to understand*  Classification of Mechanical Properties, Types Stress/Strain & stress/strain curve, Mechanical Properties based on Elastic Deformation, Strength based properties. |
| 5 | **Thermal Properties of Dental Materials** | *Students will be able to understand*  Thermal Diffusivity, Specific Heat, Thermal Conductivity, Heat of Fusion, Coefficient of Thermal Expansion (with examples) |
| 6 | **Mechanical Properties of Dental Materials** | *Students will be able to understand*  Mechanical Properties of Tooth Structure, Mastication Forces & Stresses, Toughness, Brittleness, Hardness, Ductility & Malleability & the criteria for selection of Restorative Materials. |
| 7 | **Optical & Rheological Properties of Dental Materials** | *Students will be able to understand*  Viscosity, Newtonian Liquid, Pseudoplastic, Bingham & Dilatant fluids.  The difference between Thixotropy & Rheopexy  Definition of Creep, Sag & Flow |
| 8 | **Biocompatibility of Dental Materials** | *Students will be able to understand*  Adverse effects from Dental Materials including Toxicity, Inflammation, Allergy, Mutagenicity, Local & Systemic effects of Materials, |
| 9 | **Biocompatibility of Dental Materials** | *Students will be able to understand*  Measurement of Biocompatibility (Biocompatibility testing), Current Biocompatibility Issues in Dentistry, Guidelines for selecting Biocompatible Materials |
| s10 | **Structure of Matter & Principles of Adhesion** | *Students will be able to understand*  Change of State, Interatomic Primary & Secondary Bonds, Interatomic Bond distance & Bonding Energy, |
| 11 | **Structure of Matter & Principles of Adhesion** | *Students will be able to understand*  Crystalline/Non-Crystalline Solids, Thermal Energy, Diffusion, Adhesion & Bonding |
| 12 | **Dental Polymers** | *Students will be able to understand*  History, Types, Applications & Uses of different kinds of Resins in Dentistry (BIS-GMA, TEDGMA, UDMA, PMMMA, Gamma MPTA etc). |
| 13 | **Dental Polymers** | *Students will be able to understand*  Physical Properties of Polymers including Chain Length, Cross Linking, Steps of Polymerization, Methods of Polymerization, Difference between Condensation & addition Polymerization along with examples suited to Dentistry |
| 14 | **Dental Polymers** | *Students will be able to understand*  Chemistry of Polymerization, Denture Base Resins (Acrylic Resins) – MMA, PMMA (Self-Cured, Heat-Cured). |
| 15 | **Dental Polymers** | *Students will be able to understand* Denture Relining/Rebasing, Tissue Conditioners |
| 16 | **Gypsum Products** | *Students will be able to understand*  Uses and Types of Gypsum Products in Dentistry, Differences between Dental Plaster & Stone, Classification of Gypsum Products, Calcination(wet/dry) |
| 17 | **Gypsum Products** | *Students will be able to understand* Accelerators & Retarders, Setting of Gypsum Products,  Factors Affecting setting of Gypsum Products, Tests for working/ mixing and setting time |
| 18 | **Gypsum Products** | *Students will be able to understand* Control of Setting time and  Setting Expansion, Infection Control of Gypsum Products, Control of setting time, hygroscopic and normal setting expansion, Casts for Gypsum Products |
| 19 | **Dental Amalgam** | *Students will be able to understand*  Composition of the Alloy Powder, Metallurgical phases in Dental Amalgam, Silver-Tin system, Influence of Ag-Sn Phases Manufacturing of the Alloy Powder |
| 01 | **Dental Amalgam** | *Students will be able to understand*  Amalgamation, Properties of Dental Amalgam, Factors affecting the quality of amalgam restorations, types of Amalgam powders, Low copper Alloys/High Copper Alloys, Admixed & Single Composition Alloys |
| 02 | **Dental Amalgam** | *Students will be able to understand*  Dimensional Stability of Amalgams, Measurement of strength, effect of trituration, effects of condensation, porosity, hardening rate, Creep & its significance, influence of microstructure on creep, Clinical Performance of Alamgam |
| 03 | **Dental Amalgam** | Manipulation of Amalgam  (Trituration, Condensation, Carving & Finishing), Clinical significance of dimensional change, Mercury Toxicity, Repair Amalgam Restorations |
| 04 | **Dental Cements** | *Students will be able to understand*  Introduction to Dental Cements-  Liners/bases/sealers, Zinc Phosphate Cement, Zinc Polycarboxylate Cement. |
| 05 | **Dental Cements** | *Students will be able to understand*  Metal Reinforced Glass Ionomer Cements, Resin Modified Glass Ionomer, Compomers. |
| 06 | **Dental Cements** | Zinc Oxide Eugenol Cement, Calcium Hydroxide cement  (composition, setting, working time, properties, setting reaction, manipulation) |
| 07 | **Glass Ionomer Cement** | *Students will be able to understand*  Composition, advantages of GIC over conventional cements. |
| 08 | **Glass Ionomer Cement** | Setting reaction of GIC, Theories of Setting of GIC, Modified forms of GIC. |
| 09 | **Impression Materials** | *Students will be able to understand*  Introduction to Impression Materials, Classification, Required Properties, |
| 10 | **Non-Elastic Impression Materials & Hydrocolloids** | *Students will be able to understand*  Classification, Composition, Properties. |
| 11 | **Non-Elastic Impression Materials & Hydrocolloids** | Uses, Advantages/Disadvantages of Rigid Impression Materials. |
| 12 | **Elastic Impression Materials** | *Students will be able to understand*  Classification, Composition, Properties of Elastomeric Impression materials. |
| 13 | **Elastic Impression Materials** | Uses, Advantages/Disadvantages of Elastomeric Impression Materials |
| 14 | **Bonding to Enamel and Dentine** | *Students will be able to understand*  Problems encountered while bonding Composites to Enamel – Removal of Pellicle, Acid Etch technique |
| 15 | **Bonding to Enamel and Dentine** | *Students will be able to understand*  Bonding to Dentine –Background. Conditioning of Dentine, Hybrid Layer, Classification of Dentine Bonding Systems, Bond Strength measurements, Bonding to Alloys, Amalgams & Ceramics |
| 16 | **Dental Composites** | *Students will be able to understand*  Uses, classification, types including macrofilled, microfilled, hybrid, nano-composites; and their comparison to Dental Amalgam in modern Dentistry |
| 17 | **Dental Composites** | *Students will be able to understand*  Methods of curing composites, minimizing polymerization shrinkage, advantages/disadvantages, limitations and advancements of Resin Composites in Dentistry |
| 18 | **Dental Composites** | *Students will be able to understand*  Use of Composites for Resin Veneers, Finishing of Composites, Biocompatibility of Composites, Repair of Composites, long term survival of composites. |
| 19 | **Dental Casting and Investment Materials** | *Students will be able to understand*  Materials used for casting, specific investment materials for specific prosthesis, desirable properties of Investment Materials, merits and demerits of silica bonded, phosphate bonded & gypsum bonded investment materials |
| 20 | **Dental Casting and Investment Materials** | *Students will be able to understand*  Heat treatment of High Noble & Noble Metal Alloys, Softening/Hardening Heat Treatment of Gold Casting Alloys, Casting Shrinkage & it’s compensation |
| 21 | **Dental Casting and Investment Materials** | *Students will be able to understand*  Clinical evaluation of Casting Fit, Compensation for solidification, shrinkage, ringless casting system |
| 22 | **Dental Ceramics** | *By the end of unit on Dental Ceramics, learners will be able to*  1-Define the conventional and modern definition of dental ceramics with respect to their historical importance  2- Differentiate between the compositions of conventional, domestic & dental porcelains along with the role of each component |
| 23 |  | *By the end of unit on Dental Ceramics*  4- Explain the clinical significance of using ceramics in dentistry  5- Classify dental ceramics according to their composition, processing method, firing temperature, microstructure, translucency & use. |
| 24 | **Dental Ceramics** | 6- Explain the manufacturing of ceramics with respect to:   * Mixing of raw ingredients * Fusion of ingredients * Formation of Frit * Formation of powder   They will be able to explain the APPLICATION OF PORCELAIN ON THE MODEL:   * For PFM crown * For all ceramic crown   They will be able to enumerate the STEPS OF APPLICATION including:   * Manipulation of porcelain powder * Application of porcelain * Condensation * Drying * Firing/sintering * Glazing * Cooling   7- Enumerate the properties of dental porcelains including:   * Esthetics * Hardness * Strength * Firing shrinkage * Crack formation (initiation and propagation) * Thermal properties |
| 25 | **Dental Ceramics** | * Chemical properties   8- Enumerate & define Reinforced Ceramic Core Materials including:   * Aluminous inserts & Aluminous Porcelains * Sintered Alumina Core Ceramics * Sintered Alumina Core with Zirconia * Injection Moulded Ceramics * Heat Pressed Ceramics * Cast Glass & Polycrystalline Ceramics * Yttrium Tetragonal Zirconia Polycrystals (Y-TZP) * Ceramics for CAD-CAM systems   9- Define Porcelain veneers and enumerate their types & uses in dentistry  10- Explain the preparation of the tooth for the cementation of Porcelain Veneers  11- Enlist the requirements of alloys used for the manufacture of PFM (Porcelain Fused to Metal) crown.  12- Enlist the types, advantages & disadvantages of alloys used to construct PFM alloys including   1. **High-Gold alloys** 2. **Low-Gold alloys** 3. **Silver-Palladium alloys** 4. **Nickel-Chromium alloys** |
| 26 | **Direct Filling Gold** | *Students will be able to understand*  History of Gold Foil used as a tooth filling material, Properties, Forms of direct filling gold, Direct Gold restoration |
| 27 | **Direct Filling Gold** | *Students will be able to understand*  Cohesive and non-cohesive gold, gold foil cylinders, preformed gold foils, platinized gold foil, electrolytic precipitate |
| 28 | **Direct Filling Gold** | *Students will be able to understand*  Granular Gold, Removal of Surface Impurities, Compaction of Direct Filling Gold, Condensers, Physical Properties, Physical Properties of Compacted Gold. |
| 01 | **Dental Waxes** | *Students should be able to understand*  Types of Inlay wax, Composition, Properties and Manipulation of different types of waxes. |
| 02 | **Dental Waxes** | *Students should be able to understand*  Wax Distortion, Manipulation of Inlay Wax |
| 03 | **Solidification and Microstructure of metals** | *Students should be able to understand*  Metallic bonds, Solidification of Metals, Nucleus Formation, Solidification Modes and Effects on Properties |
| 04 | **Equilibrium Phases in Cast Alloys** | *Students should be able to understand*  Classification of Alloys, Solid Solutions, Constitution or Equilibrium Phase, Interpretation of the Phase Diagram, Coring, Homogenization, Dendrite Formation in Alloys |
| 05 | **Equilibrium Phases in Cast Alloys** | *Students should be able to understand*  The Eutectic Alloy system, Peritectic Alloys, Solid State reactions, Gold/Palladium Alloys, Ternary & Higher-Order Alloy Systems |
| 06 | **Dental Casting Alloys** | *Students should be able to understand*  Types of Casting Alloys, Requirements of Casting Alloys, Gold Based Alloys & types, Heat Treatment of Alloys (Softening/Hardening), Classification of Noble/High Noble Alloys |
| 07 | **Dental Casting Alloys** | *Students should be able to understand*  Alloys for PFM Crowns, Alloys for Partial Denture Framework, Greening, Properties of Noble casting Alloys, Role of Alloying elements |
| 08 | **Dental Casting Alloys** | *Students should be able to understand*  Properties of Base Metal Alloys, , Biocompatibility of Base Metal Alloys, Allergic reactions due to Alloys |
| 09 | **Wrought Alloys** | *Students should be able to understand*  Cold Working, Composition of Steel/Stainless Steel, Solid Solutions, Different types of wrought alloys |
| 10 | **Dental Implants** | *Students should be able to understand*  History/Classification, Implant Design & Properties, Attachment Mechanisms, Implant Components, Clinical success of Dental Implants |
| 11 | **Dental Implants** | *Students should be able to understand*  Implant Materials, Systems, Selection of Implant Materials, Biocompatibility of Implants, Biomechanics |

**LIST OF TOPICS FOR PRACTICALS & OSPE**

**1st Term**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr.No** | **Topic** | **Practical/Tutorial** | **Learning Objectives** | **Teacher** |
| 1 | Gypsum Products in Dentistry | 1 | Mix Dental Plaster according to the correct P/L ratio | Dr.Omair Anjum |
| 2 | Gypsum Products in Dentistry | 2 | Mix Dental Stone according to the correct P/L ratio | Dr.Omair Anjum |
| 3 | Gypsum Products in Dentistry | 3 | Make rectangular plaster slabs according to the dimensions specified on the practical day | Dr.Omair Anjum |
| 4 | Gypsum Products in Dentistry | 4 | Carve and finish the plaster slides | Dr.Omair Anjum |
| 5 | Dental Polymers | 5 | Mixing Self Cured Acrylic Resins | Dr.Omair Anjum |
| 6 | Dental Polymers | 6 | Mixing Heat Cured Acrylic Resins | Dr.Omair Anjum |
| 7 | Dental Polymers | 7 | Differentiating b/w different stages of mixing of Acrylics | Dr.Omair Anjum |
| 8 | Dental Polymers | 8 | Construction of Denture Base with Heat Cured Resins | Dr.Omair Anjum |
| 9 | Dental Polymers | 9 | Relining/Rebasing of the Denture Base at Chairside | Dr.Omair Anjum |
| 10 | Impression Materials | 10 | Mixing and Manipulating Alginate along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 11 | Impression Materials | 11 | Mixing and Manipulating Agar along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 12 | Impression Materials | 12 | Mixing and Manipulating  Impression Plaster along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 13 | Impression Materials | 13 | Mixing and Manipulating Impression along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 14 | Impression Materials | 14 | Mixing and Manipulating Zinc Oxide Eugenol along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 15 | Impression Materials | 15 | Mixing and Manipulating Impression Waxes along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 16 | Impression Materials | 16 | Mixing and Manipulating Addition Silicones along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 17 | Impression Materials | 17 | Mixing and Manipulating Condensation Silicones along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 18 | Impression Materials | 18 | Mixing and Manipulating Polysulphides along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 19 | Impression Materials | 19 | Mixing and Manipulating Polyethers along with the understanding of working/mixing/setting time | Dr.Usman Mahmood |
| 20 | Investment Materials | 20 | Mixing Gypsum Bonded Investment Materials according to the correct P/L ratio for proper Hygroscopic Expansion | Dr.Omair Anjum |
| 21 | Investment Materials | 21 | Hands on Practical of Silica bonded investment materials in the ceramic lab | Dr.Omair Anjum |
| 22 | Investment Materials | 22 | Hands on practical of phosphate-bonded investment materials in the ceramic lab | Dr.Omair Anjum |
| 23 | Wrought Alloys | 23 | Wire bending using Stainless steel | Dr.Usman Mahmood |

**LIST OF TOPICS FOR PRACTICALS & OSPE**

**2nd Term**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr.No** | **Topic** | **Practical/Tutorial** | **Learning Objectives** | **Teacher** |
|  | Dental Cements | 1 | Mixing, working, setting and handling of Zinc Phosphate Cement | Dr.Usman Mahmood |
|  | Dental Cements | 2 | Mixing, working, setting and handling of Zinc Polycarboxylate Cement | Dr.Usman Mahmood |
|  | Dental Cements | 3 | Mixing, working, setting and handling of Calcium Hydroxide Cement | Dr.Usman Mahmood |
|  | Dental Cements | 4 | Mixing, working, setting and handling of Zinc Oxide Eugenol Cement | Dr.Omair Anjum |
|  | Dental Cements | 5 | Mixing, working, setting and handling of Glass Ionomer Cement | Dr. Omair Anjum |
|  | Dental Cements | 6 | Mixing, working, setting and handling of Resin Modified GIC Cement | Dr. Fatima Suhaib |
|  | Dental Cements | 7 | Mixing, working, setting and handling of Compomer Cement | Dr. Fatima Suhaib |
|  | Dental Cements | 8 | Mixing, working, setting and handling of Cermet Cement | Dr. Fatima Suhaib |
|  | Bonding to Enamel & Dentine | 9 | Understanding & using 1st-7th generation bonding system | Dr.Omair Anjum |
|  | Bonding to Enamel & Dentine | 10 | Understanding & using 1st-7th generation bonding system | Dr.Omair Anjum |
|  | Bonding to Enamel & Dentine | 11 | Understanding & using 1st-7th generation bonding system | Dr.Omair Anjum |
|  | Resin Composites | 12 | Application & manipulation of Microfilled Composites | Dr.Usman Mahmood |
|  | Resin Composites | 13 | Application & manipulation of Macrofilled Composites | Dr.Usman Mahmood |
|  | Resin Composites | 14 | Application & manipulation of Hybrid Composites | Dr.Usman Mahmood |
|  | Resin Composites | 15 | Application & manipulation of Nano-filled Composites | Dr.Usman Mahmood |
|  | Resin Composites | 16 | Application & manipulation of Nano-Hybrid composites | Dr.Usman Mahmood |
|  |  |  |  |  |

**Revision classes will be started after completing this course for 2- 3 weeks**

**Send up will be held in the month of August**

**POLICY FOR MISSED ASSIGNMENTS**

1. Students have to prove valid reason for missed test and assignments.
2. Students should inform the HOD prior to the date of scheduled examination.
3. Course director has discretionary power to accept reason only if found reasonable.

**POLICY FOR MARKING ATTENDANCE**

1. Present will be mark for those who will come sharp on time
2. Arrival after 7 minutes will be considered absent
3. Arrival within 7 minutes will be consider late
4. 3 late arrivals will be equal to one absent

**Course Organization**

Subject information will be delivered to the students through lectures, interactive sessions (Peer-assisted learning, small group discussions) and practical sessions throughout the academic year.

**Lectures:**

There will be 3 lectures per week, each of 60 minutes’ duration.

**Practical Sessions:**

There will be 2 practical sessions per week, each of 60 minutes’ duration. This would include histological study of various diseases of the oral and perioral region and maintenance of practical workbook.

**Tutorials:**

Tutorial sessions will be conducted by the department on need basis where deemed necessary. These can be conducted in the shape of but not limited to;

1. Small Group Discussions,
2. Student Presentations,
3. Home-based Assignments

**Tests:**

A term test will be conducted at the end of each term encompassing the syllabus taught during each term. Moreover, the department will conduct a test at the end of each unit taught in accordance with the institutional policy.

**Send-up Exam:**

A send-up exam will be conducted at the end of the 3rd term which will include the whole syllabus. This exam will be conducted on the pattern of UHS to prepare the students for the forthcoming Professional Examination by the University of Health Sciences.

**Evaluation and Feedback**

**Internal Assessment (20 Marks)**

Based on written tests (60%), OSPE and Viva (30%) and Assignments (10%).

**Written Tests** will be conducted at the end of each course. Tests will comprise of Multiple Choice Question (MCQs) and Short Essay-type Questions (SEQs).

**Practical Sessions** will be conducted at the end of the course.

**Teaching Assignments** for students will be voluntary. Guidance will be provided for preparation, and feedback provided for formative purpose.

**Viva and Objective Structured Practical Examination (OSPE):** 30 Marks

**Send-up Examination:** 2 Hours 15 minutes’ duration. UHS Pattern examination. (MCQs and SEQs), Viva-voce

**Professional Examination by the UHS:** 200 Marks

Theory 90 Marks (15 SEQs 03 Marks each, 45 MCQs 01 mark each),

Viva-voce and OSPE: 90 Marks

Internal Assessment 20 Marks

**Format for OSPE BDS Dental Materials**

Marks will be divided as per the following formula:

Structured Viva-Voce 50 Marks

25 with Internal &

25 with External Examiner

OSPE -- 10 Stations 40 Marks (02 minutes each)

**FINAL (SEND UP) EXAMINATION**

**Tentative date August 2019**

* + **Theory Examination.**

3 hours’ duration

Short essay type (SEQ) & multiple choice questions (UHS pattern)

* + **Viva/Oral Examination**. /**OSCE**

Definitive Schedule will be announced before examination date.

* + **Clinical / Practical Examination**

Will be conducted on the same day as the viva, the pattern for the clinical exam will be the same as for the clinical test mentioned above

**FINAL PROFESSIONAL UNIVERSITY EXAMINATION: (**Total 200 marks)

* Internal Assessment: 20 marks
* Theory. 45 marks. 15 short essay type questions
* Multiple choice question 45 marks
* Viva / Oral Examination & Clinical / Practical Examination (90 marks)

**RECOMMENDED TEXTBOOKS:**

* *Philips Science of Dental Materials*
* *McCabe Applied Dental Materials*
* *Restorative Dental materials by Robert. Craig*
* *Clinical Handling of Dental Materials by B.N Smith*
* *Notes on Dental Materials by E.C.Combe*
* *Dental Chemistry by Cunnigham*